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[54] SHIPPING AND STORAGE CONTAINER INTERLOCK

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[52] **U.S. Cl.** .....**214/10.5 R,** 105/366 B, 214/152, 220/23.4, 220/97 B

[51] **Int. Cl.**.....**B65g 1/14**

[58] **Field of Search** .....214/10.5 R; 105/366 B; 220/23.4, 97 R, 97 B; 248/361; 24/263 PJ

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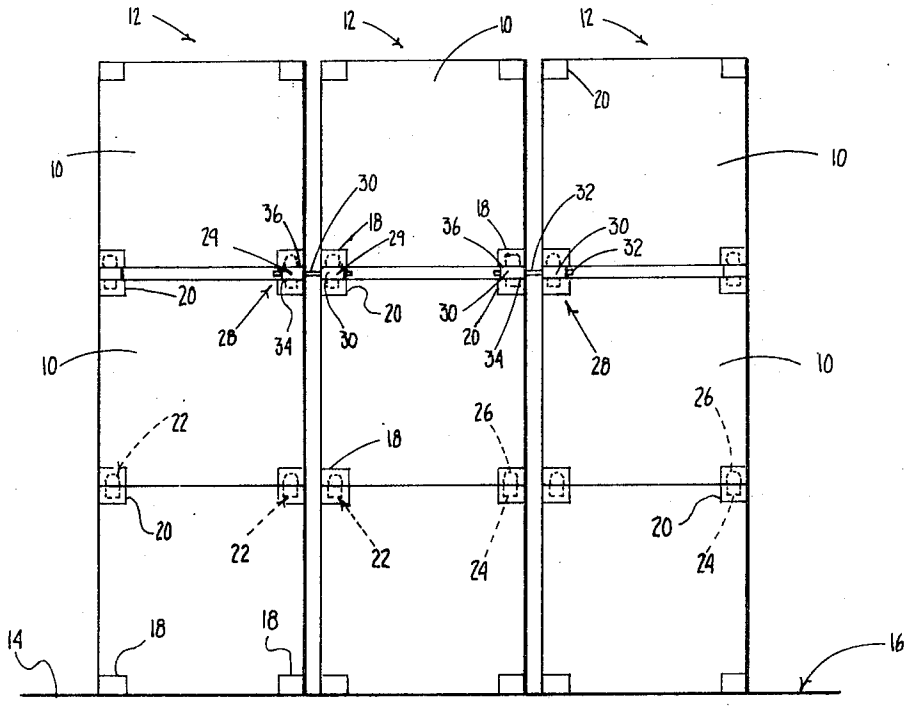
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Assistant Examiner—Frank E. Werner
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[57] **ABSTRACT**

A horizontal connection between at least two adjacent stacks of vertically stacked cargo containers having means between the containers in each stack positioning, aligning and interlocking such containers. A horizontal stack interlock member is disposed on top of at least one container in each stack at like stack elevations and is releasably secured to its supporting container. The interlocking member is rotatable about a vertical axis through a limited arc and includes at least one protrusion for horizontal alignment with the protrusion in the interlocking member on the adjacent container stack. A rigid toothed rack between the two members engages the protrusions and thereby horizontally interlocks the containers in the adjacent stacks. By rotating the interlocking members through the vertical axes, the toothed rack can be released from the protrusions to break the connection between the stacks.

20 Claims, 6 Drawing Figures



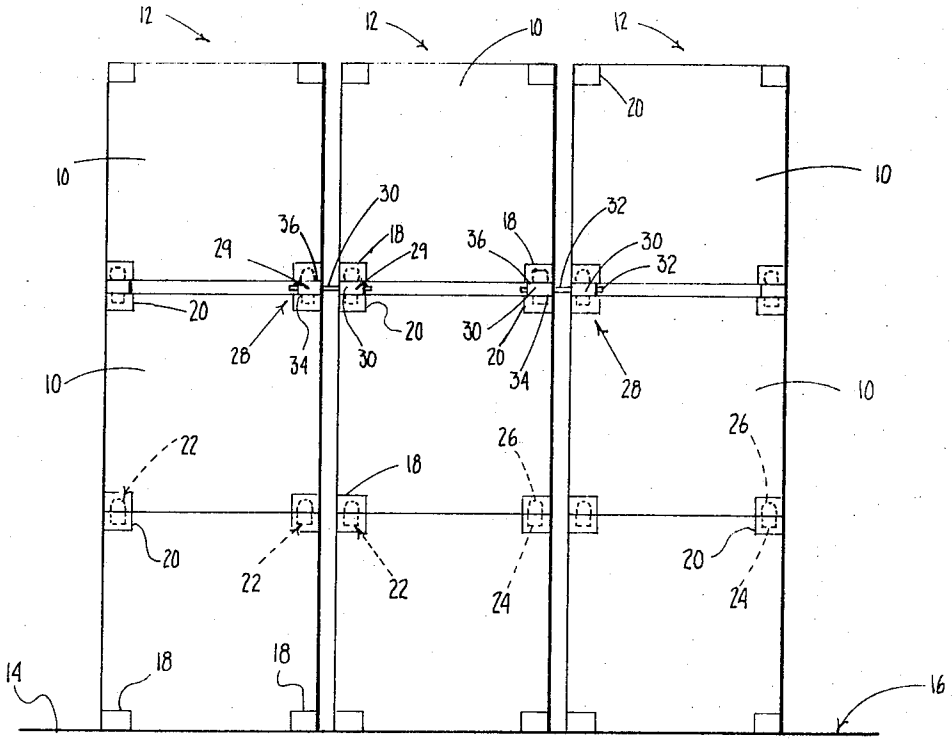


FIG. 1

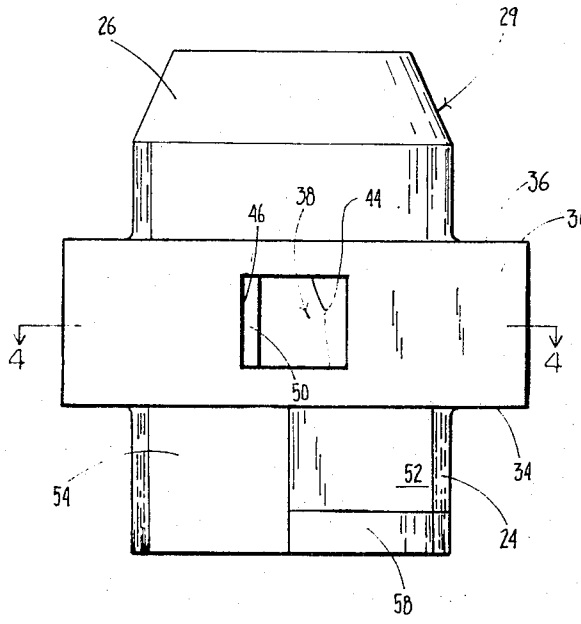


FIG. 2

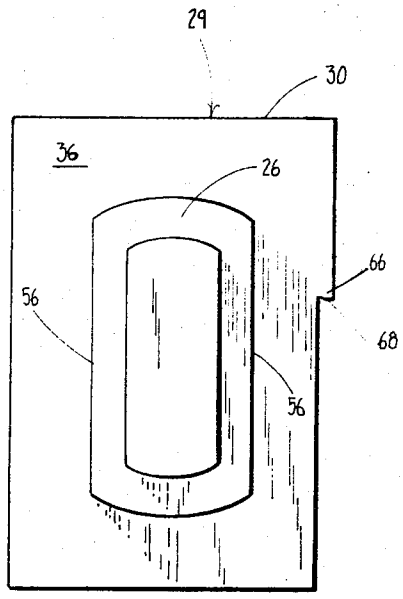


FIG. 3

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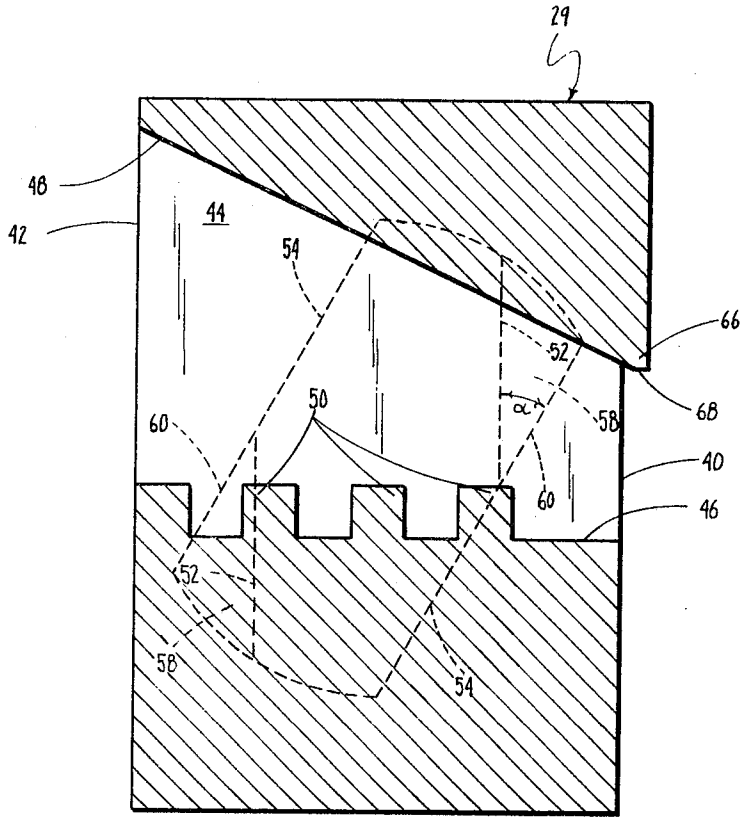


FIG. 4

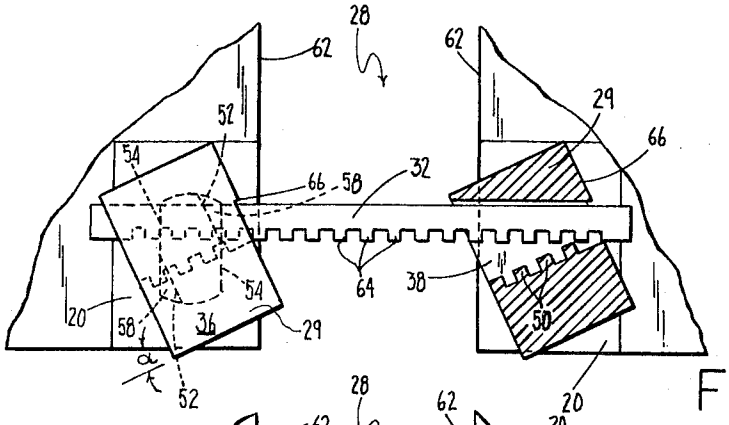


FIG. 5

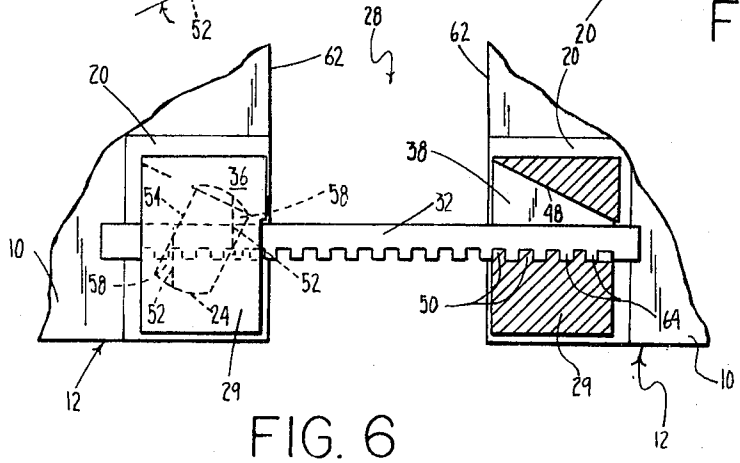


FIG. 6

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SHIPPING AND STORAGE CONTAINER INTERLOCK

BACKGROUND OF THE INVENTION

Container shipping, particularly via ocean ships, becomes increasingly important as a result of the economies that can be achieved thereby. The containers, ranging in size from 10 to 40 feet in length, 8 feet in both width and height are stacked in adjacent stacks one on top of the other. Container alignment and positioning cones are inserted in container corner fittings and precisely align each container with the one below it as the stacks are built to their full height. That height usually greatly exceeds the width of the containers. As a result the container stacks are unstable. Rough seas therefore endanger the container stack which can shift or tip-over. Such containers movement would be disastrous to the cargo and would seriously endanger the ship's safety.

To stabilize the container stacks adjacent stacks have been tied together with turn buckles, cables, and the like. Although this interconnection is usually sufficient to prevent stack tip-over it requires substantial skill, effort and time to apply and thus significantly contributes to shipping costs. Moreover, turn buckles and the like are relatively fragile, and readily attacked by saltwater corrosion and require frequent replacement.

SUMMARY OF THE INVENTION

The present invention provides a horizontal connection which locks together adjacent stacks of shipping or cargo containers to stabilize the container stacks and prevent damage to the containers or stack tip-over during a voyage or storage. The container stacks are built up with positioning and alignment cones as was heretofore customary. The cone positioning the uppermost container in each stack, however, includes means for forming the horizontal connection between adjacent container stacks in accordance with the invention.

Briefly, such a support cone or block comprises a main body portion with generally parallel upper and lower sides for placement between the uppermost container in the stack and the container immediately below that. A horizontally tapered, generally rectangular opening extends horizontally through the body and includes teeth for meshing with teeth of a connecting bar. The teeth project from a first vertical aperture defining wall and face a second vertical aperture defining wall which is longitudinally inclined with respect to the first wall by a predetermined angle. A cone member projects upwardly from the main body and is dimensioned to correspond to the cone member of a standard cargo container support. A plug depends downwardly of the body in alignment with the cone and has first and second sets of diagonally arranged parallel sides angularly inclined with respect to each other by an angle no greater than about the predetermined angle to permit limited rotational movements of the body about a vertical axis within a generally rectangular opening in a corner fitting of the container. Flange means extend substantially parallel to the upper and lower body sides away from one of the side sets for engaging the container corner fitting when the body is in its bar engaging position and thus prevent vertical removal of the body and the plug member from the corner fitting.

In use, two such blocks are placed in proximate corner fittings of containers in adjacent container stacks. They are rotated so that the second walls of the containers are in substantial alignment. A bar having teeth for meshing with the teeth on the first sides of the body openings is slideably inserted moving it along and parallel to the second opening sides until the bar extends through the openings in both blocks. Thereafter, the blocks are rotated to engage the respective teeth in the bodies and the bar and horizontally interlock the adjacent container stacks. Means is also provided for locking the bar into a tooth engaging position to prevent the accidental movement thereof from the blocks while the bodies are rotated to their engaging positions. The cone on top of the body is so positioned that when the body and rack teeth mesh the cone is positioned for engaging a bottom corner fitting of the top container and align that container with the remaining container in the stack. Once the cone is engaged rotation of the whole block about a vertical axis is impossible. The toothed rack thus positively interconnects the blocks and cannot be removed until the top container is lifted off the stack. Thus, during a voyage there is no danger of loss of the stack interlock.

The container stack interlock of the present invention is simple to construct and can be readily incorporated in the design of container positioning and aligning cones. Their installation is practically no more difficult than, and is performed simultaneously with, the installation of prior art container support cones. The locking blocks of the present invention are merely rotated into their rack receiving position, the rack is inserted and thereafter the blocks are rotated back into their rack locking container positions in which they align the next higher container with the others in the stack. As is conventional, the top containers are then locked to the cones with suitable lock pins, the construction of which is not material to this invention.

Thus, the present invention enables the quick, horizontal interlocking of cargo container stacks in a safe manner. The substantial skill, effort and time heretofore necessary to properly anchor the container stacks for a voyage are thereby eliminated with corresponding cost savings to the shipper.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic, side-elevational view of three adjacent cargo container stacks horizontally interlocked in accordance with the invention;

FIG. 2 is an enlarged side-elevational view of a container positioning and aligning block for use on cargo containers and shows the central body for horizontally interlocking adjacent container stacks in accordance with the invention;

FIG. 3 is a plan view of the member shown in FIG. 1;

FIG. 4 is an enlarged plan view, in section, and is taken on line 4—4 of FIG. 2;

FIG. 5 is a fragmentary, schematic plan view, partially in section, of two adjacent container stacks provided with horizontal interlocking means constructed in accordance with the invention and shows the interlocking means disengaged; and,

FIG. 6 is a plan view, partially in section, similar to FIG. 5 but illustrates the interlocking means in their engaged position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIG. 1, a plurality of cargo shipping and storage containers **10** are placed on top of each other in side-by-side container stacks **12**. The containers have the usual dimensions, that is, an 8 feet × 8 feet cross section and have lengths of between 10 to 40 feet. The containers rest on a support floor **14** of a container vessel **16** or the like. Each container includes lower corner fittings **18** and upper corner fittings **20** which include vertically oriented apertures (not separately shown) and through which upright container mounting blocks **22** extend. A lower half **24** of each block is secured to the lower container or the floor and an upper half or positioning cone **26** aligns the adjacent upper container with respect to the lower one and secures the two against relative horizontal movement. Suitable means (not separately shown) are provided to releasably lock the mounting blocks to the upper and lower containers.

During a ship voyage, particularly in rough seas, the ship experiences pitching and rolling motions. The relatively small floor area occupied by each stack in relation to the stack height renders individual stacks instable so that stack tip-over could occur unless the stacks are anchored and stabilized. In accordance with the invention, horizontal stack interlocks **28** are provided which connect upper portions of adjacent stacks to thereby increase the effective base area of all of the stacks and render them unstable under all commonly experienced voyage motions and inclinations of the support floor **14** from the horizontal.

In accordance with the invention, the horizontal interlocks are positioned immediately beneath the uppermost container in each container stack so that they are all in horizontal alignment relative to the container support floor. The container mounting blocks between the uppermost container and the next lower ones include a central body portion **30** to which the lower block half **24** and upper cone **26** are secured for positioning and aligning the uppermost container with respect to the next lower one in the earlier described manner. A rigid bar **32** is firmly secured to adjacent body portions **30** in each stack to thus rigidly interconnect the adjacent stacks. Relative horizontal motions of one stack are thus transmitted to all interconnected stacks via bars **32**. The enlarged base area of all stacks combined thus lends great stability to them and prevents damage to the containers or tip-over of the stacks during a voyage.

Referring to FIGS. 1–4, body portion **30** is sandwiched between the lower mounting block half and the cone. Upper and lower corner fitting **18** and **20** of the lower and upper containers, respectively, interconnected by stack interlocks **28** rest on horizontally disposed, parallel downwardly and upwardly facing sides **34** and **36**, respectively, of the body portion. The uppermost container is thus slightly spaced above the next lower one while the remaining containers in the stack, which are interconnected by conventional mounting blocks **22**, rest directly on top of each other.

Since the container length normally greatly exceeds their width, the container stacks are stable in their longitudinal directions. There is, therefore, no need for interconnecting the longitudinal ends of adjacent stacks. Interlocks **28** of the present invention thus only interconnect adjacent container stacks in the direction of their width. If desired or necessary, as when the container stack height is substantially greater than that shown in FIG. 1, so that the great stack height renders the stack instable in the longitudinal container direction horizontal interlocks can, of course, be provided between adjacent container stacks in the direction of the container lengths.

Referring now to FIGS. 2–4, the construction of interlocking mounting blocks **29** is described in detail. Body portion **30** is preferably integrally constructed, e.g., cast with or welded to lower half or plug **24** and cone **26**. The cone has the same dimensions as conventional cargo container positioning cones. The body portion has a generally rectangular outline and includes a horizontally extending aperture having a rectangular cross section and terminating in a first, small aperture end **40** and a second, large aperture end **42**. The aperture extends perpendicularly with respect to the longitudinal extent of cone **26** and is defined by vertically spaced apart, parallel horizontal surfaces **44**, a first vertical surface **46** which is perpendicular with respect to the longitudinal axis and a second vertical surface **48** which is angularly inclined with respect to the first vertical surface by an angle α. A plurality of vertically extending, aligned teeth **50** of a square or rectangular cross section extend into the aperture from the first vertical surface **46**. The teeth terminate short of small aperture end **40** and the first tooth is spaced from the small aperture end a distance greater than one tooth thickness as best shown in FIG. 4.

Plug **24** depends downwardly from lower body surface **34** in alignment with cone **26** and has a generally rectangular cross section that is defined by two sets of diagonally opposed, parallel plug side portions **52** and **54**. The first set **52** is parallel to sides **56** of cone **26** and second set **54** is inclined with respect to the first set by an angle preferably about equal to α. A flange member projects outwardly from the first parallel side portions **52** in continuation of and preferably parallel to the second side portion set.

Referring to FIGS. 2–6, the stack interlock **28** of the present invention is installed as follows. An interlocking mounting block **29** is placed on top of an upper corner fitting **20** of a container and rotated about a vertical axis to align sides **60** of flange **58** at the lower end of plug **24** with the standard aperture in the upper corner fittings. When so positioned, body **30** is angularly inclined with respect to sides of the container by the angle α as is shown in FIG. 4. For purposes of illustration and to facilitate the understanding of this invention, it can be assumed that the opening of corner fitting **20** to which block **29** is to be fitted is identical with the size and orientation of flange **58** illustrated in phantom lines in FIG. 5. Thus, the corner fitting has a generally rectangular configuration with two parallel sides and two slightly curved ends.

With block **29** positioned as illustrated in FIG. 5, it is lowered into the corner fitting until body underside **34** rests on top of the corner fitting. It will be noted that the first set of plug sides **52** is angularly inclined with respect to the corner fitting opening sides as is also illustrated in FIG. 5 and does not obstruct the lowering of the block. A second interlocking mounting block **29** is lowered into the corner fitting of the container in the adjacent stack in the same manner. The corner fittings

are left in these positions so that second aperture defining surfaces **48** of the blocks are in alignment and perpendicular to the opposing container sides **62**. Interconnecting bar **32** is now inserted between the two adjacent mounting blocks. The bar has a generally rectangular configurations, is constructed of a high-strength, rigid material such as high-strength steel and includes vertically oriented, aligned teeth **64** in a longitudinal side of the bar. The teeth are sized to mesh with teeth **50** in the first vertical surfaces **46** of body apertures **38**. Bar **32** is horizontally slideably inserted into the apertures through a small aperture end **40** of one of the bodies, past along the second angular surface **48** past the large aperture end **42**, then into the aperture of the other body through its small aperture end and along the second vertical surface of that body until the bar projects past the large aperture end and is in the position shown in FIG. **5** so that the teeth in the bar face the teeth in the vertical aperture walls.

To prevent an interference between the teeth in bar **32** and in the mounting block apertures, the teeth **50** in the first vertical walls **36** are spaced from the respective small aperture ends **40** a distance greater than one tooth spacing as was briefly mentioned above. Moreover, the angularly inclined surfaces **48** of the apertures extend outwardly past small aperture ends **40** and terminate in a nose **66** having a flat contact surface **68** which is parallel to aperture surfaces **46** and spaced therefrom a distance slightly greater than the width of bars **32**.

The bar and body teeth are engaged to horizontally interlock the adjacent container stacks by rotating mounting blocks **29** in a clockwise direction, as seen in FIG. **5**, through the angle α until the first set of plug side portions **52** abuts the corner fitting opening. At that point, aperture sides **46** with teeth **50** are aligned and in full engagement with teeth **64** in bar **32** as shown in FIG. **6**. Flange portion **70** are now set off with respect to the corner fitting opening and prevent upward removal of mounting blocks **29**.

During the rotation of the mounting blocks into their interlocked positions noses **66** and particularly contact surfaces **68** of the blocks bias bar **32** towards body teeth **50** as the teeth are rotated towards the bar teeth. Once the teeth are fully interengaged, contact surfaces **68** prevent any noticeable relative movement between the body and bar teeth towards their disengagement to positively interlock the container stacks. To break the lock, the mounting blocks must be rotated into their bar disengaging position illustrated in FIG. **5**.

Once the interlock has been set, the uppermost containers in each stack are lowered for registration with cones **26** projecting upwardly from body portions **30**. Engagement of the cones with the lower corner fittings **18** locks mounting block **29** in their bar engaging position. Accidental rotation of the blocks into their disengaged position is impossible so long as the uppermost container is in place. An accidental loss of the horizontal interlock during a voyage is thus prevented.

For opening the stack interlock **28** of the present invention, the above-described steps are simply reversed.

I claim:

1. In apparatus for shipping large cargo containers stacked one on top of the other and side by side having means securing vertically stacked containers to each other and means for securing at least some of horizontally adjacent containers to each other to increase the stability of the container stacks and prevent relative motion between the containers when subjected to normal transport motions and forces, the improvement comprising:

supports for vertically aligning the containers in a stack, a horizontally disposed member for releasably interlocking opposing supports in adjacent stacks, means permitting limited rotation of the supports about their vertical axes when placed on top of the stack, means for respectively locking and unlocking the member and the opposing supports when the supports are at their respective terminal points of rotation so that adjacent container stacks become horizontally interengaged and provide an effective container support base greater than the base of each container to thereby increase the stability of the container stacks.

2. Apparatus according to claim **1** wherein the locking and unlocking means comprises horizontally disposed openings extending through the supports, means within the openings for engaging the member and locking it to the support, and means positioning the engaging means for release of the member from the support upon rotation of the corner fastener into its vertically unlocked position.

3. Apparatus according to claim **1** wherein the locking and unlocking means comprises angularly inclined vertical sidewalls defining at least portions of the openings and positioned so that they can be rotated into engagement and disengagement with the member by rotation of the support.

4. Apparatus according to claim **3** wherein the member comprises a rigid toothed rack.

5. A cargo container support block for interengaging corner fittings of vertically stacked containers and forming a horizontal interconnection between adjacent containers in different container stacks to increase the stability of the stacks, the block comprising lower means for insertion in a lower container corner fitting, upper means for insertion in an upper container corner fitting, means for securing the lower means to the lower container fitting to prevent removal of the block from the lower fitting by applying a vertically acting force thereto, and intermediate means connected to the upper means and the lower means for engagement with a horizontally adjacent block mounted between containers in an adjacent stack, the intermediate means comprising means for firmly engaging horizontally disposed bar means when the block engages the upper fitting and the lower fitting connecting the blocks, means permitting selective separation of the block and the bar means for disengaging the block and the bar means, and means for releasably and substantially immovably locking the bar to the engaging means to thereby form a rigid connection between the horizontally adjacent blocks and stacks.

6. A block according to claim **5** wherein the means permitting separation of the block and the bar means comprises a tapered aperture in the intermediate member through which the bar means extends, and wherein the lower means comprises a plug section for insertion in a generally rectangular opening of the corner fitting, each longitudinal side of the plug section

being defined by a pair of angularly inclined side portions permitting limited relative rotation of the block in the opening for alignment of the block with the bar means in a bar means engaging and the bar means disengaging positions.

7. A block according to claim 6 wherein the securing means comprises flange means extending outwardly in a generally horizontal direction from the plug section and from angularly disposed side portions of the sections only which are substantially parallel to longitudinal sides of the opening when the block engages the bar means.

8. A block according to claim 7 wherein the bar means comprises a straight, toothed bar, wherein the engaging means comprises teeth on a first aperture defining wall and perpendicular to the last mentioned side portions, and wherein the tapered aperture has a horizontal minimum width slightly greater than the horizontal width of the bar.

9. A block according to claim 8 wherein the disengaging means comprises a second, generally vertical aperture defining second wall tapered with respect to the first wall by an angle at least about equal to the angle of possible rotation of the block in the lower corner fitting opening, and wherein the block and bar teeth have a depth which fully disengages them when a back side of the bar is parallel to and contacts the second wall.

10. A cargo container support block for interconnecting adjacent cargo container stacks with a horizontally disposed toothed bar to stabilize the stacks, the block comprising a main body portion having generally parallel upper and lower sides for placement between a pair of vertically stacked containers, a horizontally tapered, generally rectangular opening extending horizontally through the main body, teeth for meshing with teeth on the bar, the teeth projecting from a first vertical aperture defining wall and having a second vertical aperture defining wall which is longitudinally inclined with respect to the first wall by a predetermined angle, a cone member projecting upwardly from the main body dimensioned to correspond to cone members of standard cargo container supports for engaging the upper container and aligning it with respect to the main body, and a plug depending downwardly of the body in alignment with the cone and having first and second sets of diagonally arranged parallel sides angularly inclined with respect to each other by an angle no greater than about the predetermined angle, and flange means extending substantially parallel to the upper and lower body sides away from one of the side sets.

11. A block according to claim 10 wherein a portion of the first wall adjacent a small end of the aperture and extending towards the other aperture end a distance greater than one tooth thickness is tooth free.

12. A block according to claim 10 wherein the second wall extends past a small aperture end.

13. A block according to claim 12 including a bar retaining surface defined by a portion of the second wall disposed outside the aperture which is substantially parallel to the first wall and spaced therefrom a distance slightly greater than a width of the bar for accommodating the bar and preventing movement of the bar away from the aperture teeth when the bar and the block are in an interlocked position.

14. A cargo container shipping and storing system comprising at least two stacks of rectilinear cargo containers, each stack comprising a plurality of vertically stacked containers and occupying a support surface having minimal dimensions substantially less than the overall stack height, means between the containers in each stack positioning, aligning and interlocking the containers in each stack, and a horizontal stack interlocking member disposed on top of at least one container in each stack at like stack elevations and at points adjacent to the other stack, means for releasably securing the members to the respective containers, means permitting at least limited rotation of the members about vertical axes, at least one protrusion on each member positioned for horizontal alignment with the protrusion on the adjacent member in the adjacent stack by correspondingly rotating the members about the vertical axes, rigid means engaging the horizontally aligned protrusions in adjacent members to thereby horizontally interlock containers in adjacent stacks, and increase the effective base area of the stacks and the stability of the stacks against tip over, and means for selective disengagement of the protrusions and the rigid means by rotating the protrusions about the horizontal axes for removal of the rigid means and of the interconnection between the stacks.

15. A system according to claim 14 wherein the disengaging means includes means permitting the slideable removal of the rigid means from the members.

16. A system according to claim 15 wherein the members are positioned between vertically adjacent containers in a stack and vertically space such containers.

17. A system according to claim 16 wherein the members are secured to container positioning and aligning means, and wherein the member rotating means comprises means permitting the simultaneous limited rotation about the vertical axis of each member and the associated positioning and aligning means.

18. A system according to claim 17 including means for automatically biasing the rigid member into engagement with the protrusion of a member upon rotation of the member about the vertical axis, the biasing means including means positively preventing the disengagement of the protrusion and the rigid means in the absence of further rotational movement of the member.

19. A system according to claim 18 wherein the containers comprises cargo vessel containers and wherein the member and the rigid means are disposed immediately beneath the uppermost container in each stack.

20. A method for stabilizing cargo shipping containers stacked in adjacent stacks on shipping vessels to prevent relative stack motion or stack tip overs from vessel motions during rough seas and the like, the method comprising the steps of placing at least one pair of linearly arranged, horizontally oriented protrusions at like elevations on top of a container in each stack, angularly inclining the protrusions on one stack with respect to the protrusions on the adjacent stack, placing a horizontally positioned rigid bar including aligned, protrusion receiving depressions adjacent the protrusions on each stack, rotating the protrusions about vertical axes towards the depressions and moving the depressions into engagement with the protrusions

to thereby rigidly interconnect the protrusions on each stack, releasably locking the bar to the protrusions on both stacks, and securing the protrusions on each stack to another container placed on top of the protrusions to firmly anchor the protrusions to their respective stacks and form a rigid, stack stabilizing interconnection.

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